REMARKS

Applicants, their principal representatives in Germany, and the undersigned have carefully reviewed the first Office Action of January 22, 2008 in the subject U.S. patent application, together with the prior art cited and relied on in the rejections of the claims. In response, the specification, drawings and claims of the application have been amended. It is believed that the claims now pending in the subject U.S. patent application are patentable over the prior art cited and relied on, taken either singly or in combination. Reexamination and reconsideration of the application, and allowance of the claims is respectfully requested.

In a review of the Substitute Specification of the subject application, in the course of the preparation of the present Amendment, a minor typographical error was noted in paragraph 010. That minor error is being corrected by this Amendment. No new matter is being presented by the correction.

The Office Action noted that Figs. 1 and 2 of the drawings are missing. There are submitted herewith replacement sheets 1 and 2 of the formal patent drawings, as filed with the application, and consisting of Figs. 1 and 2. Also enclosed is a copy of the date-stamped receipt card which indicates that two sheets of formal patent drawings were filed with the application. Also filed with the application was a copy of the published PCT application WO 04/017034 which included the same Figs. 1 and 2, but with German legends. It is believed that the enclosed Figs. 1 and 2 do not constitute any new matter because they are duplicates of the two sheets of formal drawings which were filed with the application, and whose receipt was acknowledged by the Patent Office. Also, the currently submitted Figs. 1 and 2 of drawings are the same, in content as the two drawing figures which are part of WO 2004/01734, which was filed with the application and which is the published PCT application of which the subject U.S. application is the U.S. national phase. The published PCT application's drawings have German language legends but are otherwise the same as the two replacement sheets being submitted

herewith. No new matter is being presented by the submission of these two replacement sheets of drawings.

The specification of the application, as filed, was apparently objected to because the recited drawings were not attached to the specification. It is believed that the submission of replacement Figs. 1 and 2 overcomes the Examiner's objection to the specification.

Claims 15-20, 23, 24 and 27-32 were rejected under 35 USC 103(a) as being unpatentable over the four reference combination of the applicant-cited publication to Swain in view of the applicant-cited Macfarlane U.S. published application No. 2002/0021444 and the Examiner-cited U.S. patent Nos. 6,950,554 to Shiratani and 6,911,963 to Baba et al. Claims 21 and 22 were rejected under 35 USC 103(a) as being unpatentable over the above-noted four reference combination and further in view of U.S. patent No. 5,268,753 to Yamaguchi. Claims 25 and 26 were rejected under 35 USC 103(a) over the four reference combination and further in view of U.S. patent No. 6,486,981 to Shimura. Claims 34 and 35 were rejected under 35 USC 103(a) as being unpatentable, again over Swain in view of Macfarlane, Shiratani and Baba, as applied previously, and now also further in view of U.S. patent No. 6,751,348 to Buzucoill. Claims 35 and 36 were rejected, again under 35 USC 103(a) and again in the combination of four references relied on by the Examiner and further in view of EP 0 473 432 B1 to Harrington.

The subject U.S. patent application discloses, and claims a method for analyzing the color deviation in imaging using an image sensor. As described in the substitute specification, as depicted in the two sheets of drawings, and as recited in independent claims 15 and 16, as filed, and even more clearly as amended, the subject method uses specifically generated output signals 12 and 13 as representations of the colors of a printed image whose color deviation is to be analyzed. As seen in Fig. 1, and as recited in claims 15 and 16, an image sensor is used to generate pixel by pixel image sensor signals of an image. These signals are provided as three separate image sensor signals, one for each of first, second and third separated color channels.

These three color channels are typically the red, green and blue colors that the cones of the human eye absorbs.

In the present invention, the first color channel image sensor signal and the second color channel image sensor signal are linked to each other using a first calculation specification. This is described at paragraph 011 of the substitute specification and is used to compensate for the color perception phenomena of the human eye. In accordance with understood human eye physiology, as discussed at paragraph 015 of the substitute specification, substantially two types of reception fields of the human eye are responsible for color view. The first is the red/green field. The second is the blue/yellow field. However, since yellow is a variation of red and green, the second reception field inputs signals from the blue cones and well as signals from the red and yellow cones.

An image sensor does not "see" colors as does the human eye. Thus, the image sensor signals have to be adapted so that they will be more representative of which is actually seen by the eye of the observer.

In accordance with the present invention, this is done by linking the first or red color channel image sensor signal and the second or green color channel image sensor signal using a first calculation specification. A first output signal 12 is generated using the first calculation specification linked first and second color channel image sensor signals, as seen at 12.

The third or blue color channel image sensor signal is linked with combined first and second color channel image sensor signals using a second calculation specification. The result is the generation of a second output signal 13.

The first calculation specification is selected for forming a weighted difference between the second channel color image sensor signal and the first color channel image sensor signal. The second calculation specification is selected for forming a weighted difference between the third color channel image sensor signal and a combination of the first and second color channel image sensor signals. The first and second output signals of the first and second compensation

color channels are formed corresponding to color receptive fields of the human eye. The first and second calculation specifications are selected for forming a weighted difference between the color sensor signals. The ultimate goal is to try to replicate the color perception of the human eye. The underlying concern is that the image sensor signals, by themselves, do not correlate to the color peripheries of the human eye. By using the method in accordance with the present invention, which applies a calculation specification to the color channel image sensor signals, with the calculation specifications being selected for forming a weighted difference between the color channel image sensor signals, the result will be output signals whose variance, in response to sensed color changes in the images being analyzed, will be more similar to the variances that would be noted by the human eye.

In the rejection of claims 15 and 16 as being unpatentable over the four reference combination of the Swain article, the Macfarlane published application, and the Shiratani and Baba patents, it was asserted that Swain "discloses a color image deviation analysis method." In fact, the Swain article is directed to the provision of color histograms of multicolored objects so that a robot can either identify an object with a known location, or determine the location of a known object. Color is used to help the robot perform its desired tasks because it is local and is largely independent of different views of the object and the location of the object. While these objectives of the Swain publication are admirable, they are not relevant to the subject invention.

As defined in the Swain article, at page 13 thereof "a color histogram counts how much of each color is in the image." Further, "Given a discrete color space defined by some color axes, the color histogram is obtained by discretizing the image colors and counting the number of times each discrete color varies in the image array." In other words, the color histogram which is the basis for the Swain article, is a map or a profile of the number of times each color appears in an object whose color is being measured. It is again to be noted that the purpose of this color measurement is to allow a robot to use color to either identify an object with a know location or to determine the location of a known object.

The Swain article then discusses the concept of "histogram intersection." In simple terms, that means the comparison of a histogram of an object to be identified, and which is situated at a known location, with histograms of known objects. The term "histogram intersection" is thus a matching of a known histogram with a second histogram in an effort to identify an object.

As discussed at the bottom of page 15 and the top of page 16 of the Swain article, testing was done to see if such histogram intersections could identify objects, whose locations were known, by comparing these histograms with a database of known histograms. The discussion at page 16 of the Swain article, which is relied on by the Examiner, is a discussion of the use of the specific color axes which were used to form the histograms, both of the known objects to be used to form the database, and of the unknown objects whose identities were to be determined by comparison to the database objects.

The assertion in the Office Action, at page 4 thereof that Swain shows "...linking said first color channel image sensor signal with said second color channel image sensor signal using a first calculation specification..." is not supported by any teaching in the Swain article. Instead, the article discusses the use of "color axes" in the histograms, as recited at the top left of page 16. This is a measure of degree of saturation of a color. In a three dimensional graph, these are red, green and blue axes. The discussion at page 16 is directed to the locations of points of color a number of times each color occurs as an image array. The assertions set forth at page 4 of the Office Action have no support in the Swain article. Swain is directed to a procedure for quantifying the numbers of times each color occurs in an object. Such quantification or counting is then used in the histogram intersection procedure used to identify an unknown object by comparing its color histogram to the color histograms of 66 known objects. All of the importation of the language of claims 15 and 16 into the body of the Office Action does not mean that the reference actually is directed to, or even suggests those recited features of the subject invention.

The Swain reference is directed to the recognition of inanimate objects by the method of histogram intersection. A box of Crunchberries cereal is analyzed for its color content. The result is a color histogram of an "unknown" object. The color histogram, which counts how much of each color occurs in a discrete space, of the "unknown" object, is then compared with the color histograms of 66 known objects. The concept of histograms intersection allows a comparison of the two histograms to be made to see if there is a match. All of the discussion in Swain of red/green; blue/yellow and white/black axes have to do with a checking of the numbers of times each color appears in a particular object. Swain has no teaching or suggestion of the various steps that are recited in either of currently amended claims 15 and 16. The assertions, at page 4 of the Office Action are not supported by any teachings of the Swain article. Swain does not perform any of the steps recited in claims 15 and 16, as asserted at page 4 of the Office Action. While the Examiner can easily import the claim language into the body of the Office Action, and can assert that the reference provides a teaching of such steps, there has to be some factual basis, in the reference, for such an assertion. In the Swain reference, there is no such factual teaching. The Examiner is requested to indicate where in the Swain reference the teachings attributed to it can be found. At page 5 of the Office Action, it is stated that Swain does not expressly disclose "...weighing factors..." It is also recited that Swain "...does not explicitly teach the clarification and minimum selection." Since those terms do not appear in the language of claims 15 and 16, it is unclear what relevance their absence from the Swain reference has to the situation at hand.

The secondary reference to Macfarlane is directed to a method and to a device for measuring colors of skin, teeth, hair and material substances with a color index. It is thus not at all similar to the Swain article, which uses a histogram, or a count of how much of a color of an object appears in an image, to indentify an article by comparison of the object's histogram to known histograms. It is thus not readily apparent, at least to the undersigned, how the teachings of Macfarlane could be combined, in any meaningful way, with the disclosure of Swain.

In Macfarlane, a color index of, for example, a person's skin, is measured and calculated using a two step process. Initially, a sample's reflectance spectrum's contribution to four colors is weighed using a unique set of weighting factors. The second step places the sample's reflectance spectrum's contribution to the appearance of the four color components in opponency to each other and calculates the color index.

Macfarlane is directed to a system for accurately categorizing skin colors or teeth colors or hair colors in all illuminating conditions. It is not directed to a system for attempting to identify an unknown object based on a comparison of its color histogram with a group of stored color histograms. It is not remotely similar to the process described in the Swain article. There is no common ground between the two other than the fact that both use color aspects of an object. In Macfarlane, there is an attempt to evaluate a color of skin or teeth or hair of a person while taking into consideration the reflectance spectrum of a sample. These weighting factors are used to calculate a sample's reflectance spectrum's contribution to the appearance of redness, yellowness, greenness and blueness.

Not only does Macfarlane have little to do with the Swain process, it has even less to do with the subject of the present invention. The purpose of the present invention is to analyze color deviations of an image through the use of an image sensor. Knowing that such an image sensor does not "see" colors in the same way as does the human eye, the three color channels, which provide separate image sensor signals, are linked and used to generate first and second output signals that can then be classified. The output signals are generated using first and second calculation specifications. In other words, the signals are manipulated in a certain way using calculation specifications. These calculation specifications link the colors together in a way that is simulative of receptive fields of the human eye. The calculation specifications are each selected to form a weighted difference between the color channel image sensor signals. Merely because Macfarlane recites the use of "weighting factors" for calculating the contributions to the appearance of redness or yellowness or greenness or blueness, by the

reflective spectrum of the skin does not make its teachings relevant to the subject invention. Again, the importation into the rejection of language from the claims sought to be rejected does not support an assertion that the relied-on reference actually includes, suggests or discloses the claim language. This is again the situation with the Macfarlane reference.

The third reference of the four reference combination asserted by the Examiner, U.S. patent No. 6,950,554 to Shiratani is directed to a learning type image classification system. It is capable of clarifying and putting in order a number of images. It has nothing to do with analysis of color deviation of an image. Instead, this reference teaches a procedure for classifying a plurality of images. The procedure includes a step of selecting a portion of a plurality of images to be clipped and a means for accomplishing such a clipping. The feature of the region to be clipped is extracted. While the reference recites that one of the features which could be clipped is a color, that is no different from other features, such as shape, texture and the like which could also be clipped and classified.

The assertion, in the Office Action that Shiratani is from the same field of endeavor, is questioned. As discussed above, Shiratani has nothing to do with the analyses of color deviations of images. Instead, this document is directed to image classification based on clipping or selecting a particular region of a plurality of objects for classification of the objects. The Macfarlane reference deals with a color measurement region for skin and teeth. The Swain article is directed to object identification based on color histograms. Such a diverse collection of art is not readily combinable. Even if such a combination were possible, the result would still not be the method of analyzing color deviation of images, as recited in claims 15 and 16.

The fourth element of the reference combination relied on by the Examiner, U.S. patent No. 6,911,963 to Baba is directed to a field-sequential color display method. Again, this reference is not at all relevant to the subject area of endeavor. It is directed to computer graphics processing, as evidenced by its classification. Its inclusion in the present rejection is clearly the result of computer-generated key word searching with no regard to the context in

which the terms are being used. Merely because a document recites the words "red," "blue," and "green" does not make it relevant to the subject invention. The statement that Baba recites "reducing the color breakup of an optical image" has no bearing, either direct or indirect on the field of endeavor to which the subject invention is directed or to the specific method recited in currently amended claims 15 and 16.

Claims 15 and 16 as discussed above, are directed to a method for analyzing color deviations or images. They accomplish this by providing separate image sensor signals for each of three separate color channels. These three separate signals are linked in specific ways, to produce two output signals that are classified. The way that the separate symbols are linked uses first and second separate calculation specifications, as indicated in Fig. 1 at V_1 and V_2. The two calculation specifications are selected so that they will form weighted differences between the respective color channel image sensor signals. The resultant compensation color channels that generate the two output signals are formed to correspond to either a red/green reception field of a human eye or to a blue/yellow reception field of a human eye. Since the yellow color is a combination of red and green, the blue/yellow reception field to which the second resultant compensation color channel corresponds, is formed by linking the third color channel image sensor signal with the first and second color channel image sensor signals. It is thus believed that claims 15 and 16, as filed, and even more clearly as amended, are patentable over the prior art combination of references attempted to be asserted by the Examiner.

All of the rest of the claims pending in the subject U.S. patent application depend, either directly or indirectly from one or the other of believed allowable independent claims 15 and 16. These claims are thus also believed to be allowable. The several additional references cited by the Examiner with respect to these claims do not provide the teachings that are so clearly missing from the four references attempted to be combined in the rejections of claims 15 and 16. Accordingly, dependent claims 17-36 are also believed to be allowable.

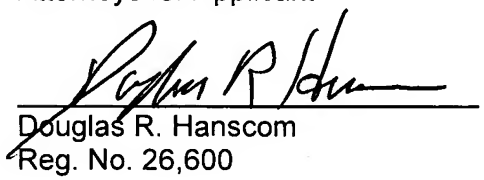
SUMMARY

The substitute specification has been amended to correct a minor typographical error. The two originally filed sheets of formal patent drawings, which the Examiner asserts are missing from the electronic file, are being resubmitted. Claims 15 and 16 have been amended to more clearly patentably define the method for analyzing color deviation of images, in accordance with the present invention. Dependent claims 17-36 have been carried forward. It is believed that all of the claims now pending in the subject application are patentable over the prior art cited and relied on. Allowance of the claims, and passage of the application to issue is respectfully requested.

Respectfully submitted,

Volker LOHWEG
Harald Heinrich WILLEKE
Applicants

JONES, TULLAR & COOPER, P.C.
Attorneys for Applicant



Douglas R. Hanscom
Reg. No. 26,600

April 22, 2008
JONES, TULLAR & COOPER, P.C.
P.O. Box 2266 Eads Station
Arlington, Virginia 22202
(703) 415-1500
Attorney Docket: W1.1914 PCT-US

IN THE DRAWING

Please enter the two accompanying sheets 1 and 2 of Replacement Drawings, consisting of Figs. 1 and 2 in place of the two originally filed sheets 1 and 2 of drawings, also consisting of Figs. 1 and 2, which originally filed sheets of drawings were asserted by the Examiner as being missing.